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AUTHOR Dobler, Judith M.
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ABSTRACT

When teaching writing in content areas, such as hydrobiology, instructors should remember that what works in a writing class does not necessarily work across the curriculum. Yet although differences exist, content area teachers still need writing departments to teach their students to write. One possible response is the generic course, such as "Writing in the Sciences." However, writing in biology is very different from writing in chemistry and physics--the problem with the generic approach is in trying to design one course to teach many different types of writing. Furthermore, writing teachers generally do not know enough about the assumptions, methods, and vocabulary in other disciplines to be able to judge accurately the writing in that discipline. If writing teachers consider teaching generic courses, they need to recognize both their own limitations and the limitations of such courses. Beyond the generic course, two alternatives exist. First, content teachers can be encouraged to teach writing processes in their own classrooms, breaking writing assignments into smaller, more manageable chunks for their students. Secondly, a thorough study of academic writing should be made, analyzing the history of writing development in different fields to find similarities and differences. Perhaps with this knowledge, writing instructors could teach not simply a generic writing course, but methods for analyzing the writing in a discipline, for discovering its constraints, and for adapting prose to fit those constraints. Students would then be enabled to make their own analysis and to adjust their writing accordingly. (One page of footnotes is appended.) (MM)

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Wading Across the Curriculum: A Look At Writing in Hydrobiology

by

Judith M. Dobler

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Abstract:

The article considers whether writing faculty are prepared to teach students in another discipline, hydrobiology for example, the writing skills needed for success in that discipline. Having spent a semester as a teacher/student in a hydrobiology course, the writer presents her observations: In order to teach intradisciplinary writing, writing faculty would need to learn the vocabulary, style, audiences, and purposes of the discipline. They would need to recognize differences between the disciplines' methods of inquiry and their own and to accept both as valid. They would need to help content teachers devise teaching methods and goals for each discipline individually. Finally they would have to avoid imposing counterproductive standards on the writing from outside the discipline.

The writer suggests that content faculty take responsibility for teaching intradisciplinary writing and that writing faculty develop methods which would teach students to analyze writing in a discipline and then to make adjustments in their writing as they move from one discipline to another.

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WADING ACROSS THE CURRICULUM

A Look At Writing in Hydrobiology

by

Judith Dobler

In 20 years of exploring the relationship between literature and science, I contiue to be amazed by the barriers to transferring writing skills into a tightly defined area such as hydrobiology. At Loyola College in Baltimore we have been developing a writing across the curriculum methodology for six years. During that time I have worked in a variety of disciplines attempting to find a paradigm for writing skills. Hydrobiology was a new challenge. The day I tried to cross a saltmarsh in borrowed waders and promptly fell in, however, I decided that I had a lot more to learn about wading across the curriculum.

Even deciding how best to proceed created problems. The hydrobiologist and I quickly discovered we had to adjust our personal styles, styles which reflect the methods of our disciplines. I belong to the let's-try-it-out-and-see-what-happens school. I jump right into a new course, immerse myself in the lectures, the textbooks, the methods, and, in this case, the neighborhood saltmarshes, the freshwater lakes, and the streams, called--appropriately, I soon discovered to my chagrin--falls.

Unlike me, the hydrobiologist is more cautious. He's a thoroughgoing scientist, a toe-dipper. He wanted to proceed step-by-step, to know just what he was getting into so he'd ask questions like "how will I explain you to the students?" and "how much writing

do you think we should have the students do?" and "how can we teach the students to write better research papers?"

Sometime during the middle of the first or second week, I stopped assuming that hydro would be easy. For one thing, I didn't have the right vocabulary. Willem kept talking about primary productivity and eutrophic and oligotrophic lakes and various seasonal mixic patterns. I didn't have the right research tools either. I had to learn to calculate the primary production of a lake using the chemical formula for photosynthesis. In the lab I was a disaster. Most of the time I couldn't see through the microscope, let alone recognize differences among larvae, even when I looked at the pictures in the taxonomy reference book. And I got totally lost when I began reading articles in Science which contained sentences like this:

> The activity of the electron transport system of organisms that possess a respiratory chain can be determined enzymatically (4), but the technique runs into analytical difficulty when applied to reduced sediments, is biased against fermenters, and the results cannot be easily converted into natural rates (2).[1]

I just didn't know what to do with a technique that seemed to be "biased against fermenters"--whatever they were.

The point is that before I could begin to make suggestions about writing in hydro I needed to see how writing fit into a biologist's way of working. Every biology student, too, needs to master all the tools of the biologist--the mathematics, the

language and reading skills, the microscope, the probe, the Secchi disc--as well as the writing. And he or she needs to use these tools the way a biologist uses them--as tools for inquiry and for communicating discoveries.

From the beginning, then, I had to remember that what works in a writing class doesn't necessarily work in a biology class. As a writer, I often write my way through a subject. I don't always know what I want to say until I've said it. Biology students, I've found, though, need to complete their experiment before they write although occasionally they sort out procedures by writing down their ideas and steps.

The solution seemed to lie in acquiring a biologist's knowledge and his world view. Unfortunately, my methods for gaining that information turned out to be rather unorthodox. I hadn't fully understood, for example, why primary productivity was highest in the fall and spring. Then, one September afternoon I found myself rowing on Loch Raven Reservoir with my YSI meter, Secchi depth disc, and LaMotte kit. Seeing the sun penetrate the water and measuring the depth at which it became murky, I realized intuitively that if I were an alga I'd choose just this sort of day to get my work done.

Thus I've learned that writing isn't the only way to make discoveries and that while Willem's and my methods of inquiry might overlap, they aren't identical. Willem studies water very systematically, depending less on serendipity than I do. He combines his knowledge of water, gleaned from years of reading,

with hands-on experience. Recently, he's been collecting specimens from the Herring Run watershed so he can study the ways life in an urban stream responds to pollution. He does it with charts and graphs and his computer. Needless to say, I can't imagine Willem ever trying to think like an alga.

A biologist doesn't use writing in exactly the same way we do. For one thing, accuracy is critical. A biologist needs to be sure to label phenomena accurately, using Latinate and polysyllabic terms. I'd argue that the biologist needs prose that's more precise than elegant. Yes, there is overlap, but there are also big differences between biology and composition journals. Hydrobiologists tend to squeeze as much information into as small a space as possible since there are so many discoveries waiting to be presented. Here are a few sentences from another article in Science:

> Measurements of fluorescence in vivo on whole and size-fractionated samples, with and without the addition of the photosynthetic inhibitor DCMU (17), indicated the same relationship between size fractions and between sites as did measurements of extracted chlorophyll.[2]

The prose is precise, but not very elegant. When I read sentences like this my fingers itch for a red pen--I don't even own a red pen. I'm tempted to include some basic principles of style and clarity in my hydro kit bag. But I wonder if that's wise. Let me take a step back and explain:

Writing Across the Curriculum was originally intended to get

teachers in other disciplines to teach their students to use writing as a tool for discovery. The movement also has helped these teachers to make their assignments more meaningful, to get away from the contextless "research paper." Our colleagues are using writing as a tool for inquiry in all sorts of inventive ways. Now they're asking for ways to improve their students' "serious," pre-professional writing--the lab reports and essay exams and summaries of journal articles. But I'm not sure that Writing Across the Curriculum was intended, ever, to reform academic prose. After all, how could we be so presumptuous as to suggest to our colleagues that they can't write? We should, however, have seen that we might be asked to teach students to write like professionals in other fields.

Unfortunately, we don't exactly know what "good writing" is in other fields. As Richard Lanham and others have pointed out, clarity is not valued as highly in the marketplace as it is in the schools.[3] Furthermore, a colleague and I demonstrated that psychologists, at least, can judge the readability of their professional prose accurately, suggesting that a standard of sorts, but not of the literary ilk, for prose may exist within disciplines at least.[4]

But, my colleagues in other fields also admit that while they'd like to improve student writing, they often feel they have neither the time nor the training nor the inclination to require as much writing as their students need. Few of my colleagues <u>have</u> been trained to analyze the style of an article or to

suggest how a writer can improve the sound of her prose, let alone to teach students how to address a specific academic audience. Kinneavy traces the major source of the problems in student prose to the students' inability to anticipate their readers needs:

> The readers of a given scientific journal [for example] are inevitably a very restricted group within the larger group of scholars. It is a special and intelligent group, generally capable of the same mental calculations and possessed of the same logical sophistications as the writer, but uninformed of the particular topic at issue.[5]

Yet, how can anyone, a content teacher or a writing teacher, teach students to address such an audience, when the students aren't yet members of that group?

Content teachers, then, have good reasons for asking writing departments, like ours, to teach their students to write. One possible response to this request is the generic course: "Writing in the Natural Sciences," "Writing in the Social Sciences," Writing in the Humanities," and so on.

I have some reservations about this course, unless we correct some of its inherent flaws. One danger is that by teaching generic courses, a Writing Department, like ours at Loyola, will become a service department, with no integrity of its own. But that's a political problem and there are far more serious pedagogical problems to be addressed.

As Faigley and his colleagues found out in trying to design

a Writing in the Social Sciences courses, writing in psychology is quite different from writing in anthropology or sociology.[6] Writing in biology is even less like writing in chemistry or physics. One course for all these different fields would be unlikely to serve any of them.

Furthermore, writing teachers generally don't know enough about the assumptions, the methods, and the vocabulary in other disciplines to be able to judge the writing in that discipline accurately. David Hamilton argued this as early as 1976. Furthermore, as J. Robert Oppenheimer once noted, science is defined in words and phrases which are "almost impossible to translate" into conventional lay language.[7] If that's true, the best I as a writing teacher can do is determine whether or not a hydrobiology article is well written, according to standard American usage. I certainly can't tell whether it's good biology.

If socialization becomes the goal of such a generic writing course, we find other problems. By what writing standards do we judge an essay on "The Nitrogen Fixation of Floating Diatom Mats?" Do we reward its clarity and elegance or its success at cramming a lot of information into a small space? Who is the audience for this paper? Are their goals and judgements the same as ours? If not, do we compromise our standards or theirs?

When writing has multiple audiences, the writer's difficulties increase enormously. In 1985 Kantrowitz reported that different groups perceive and judge the same prose

differently.[8] He had studied the perceptions of both professionals and lay people in a manufacturing organization. He took some technical reports and had them edited for in-house consumption. Then he sent both edited and unedited versions through channels. He asked those who read the reports to decide which version was more readable and which better served the purposes of the organization. He discovered that among the more technical staff, particularly the engineers, the more readable version was not necessarily the version they chose as the best. Somehow, even though they agreed that the edited version was a more sound choice economically--because it could be understood more quickly--the engineers preferred the unedited version because they trusted it more, it hadn't been watered down.

The point is that if we consider teaching generic courses, we need to recognize both our own limitations and the limitations of such courses:

1. If we hope to socialize students into their major fields by teaching them to write like professionals, especially if they want to become scientists or academics, we will be unsuccessful because we don't know enough about other fields to do a responsible job.
2. Since a generic course like writing in the natural sciences is likely to combine the writing from various fields into a single course, generic courses cannot possibly teach the students in one field how to write like professionals in any given field.

3. The writing done in a generic course, unless it is tied to a particular field, is likely to become superficial and irrelevant--mere school writing.
4. If we create generic courses simply as a vehicle to get students to write more, on the assumption that as they write more they'll improve, promises about teaching them to write in "the social sciences," or whatever, are false.
5. If we improve students' writing by encouraging them to write clearly at all times, we may be doing them an eventual disservice when they become professionals in fields which do not value clarity above other features of prose in such fields.

What can we do then? It seems to me that we can do two things right now and then decide whether we still want to consider the generic course after we see how the alternatives work out. First, with our new knowledge of the writing process, thanks to the research of Flower and Hayes and Walvoord, we can encourage content teachers teach writing processes in their own classrooms, helping them to break writing assignments into smaller, more manageable chunks for their students. At Loyola, for example, we are now beginning to sequence <u>within</u> and <u>across</u> disciplines so that no one instructor bears the whole load of teaching students everything they need to know about writing. In our introduction to sociology, for example, the instructor requires only a journal and a literature review, knowing that by

the end of four years, his students will have had the whole gamut of writing experiences in other sociology and core courses. This way our colleagues will be able to socialize their majors as they need to and yet our students will get the benefit of added instruction in writing.

The second suggestion is more revolutionary. To date no one has made a throrough study of academic writing. We know very little of the history of science writing, for example, and yet, as Toulmin has argued, science writing did not evolve haphazardly, but in response to the rhetorical situation from which it arose.[9] We are better equipped than scientists, however, to analyze scientific writing, to determine whether certain aims of discourse lead naturally to certain styles as well as modes as Kinneavy suggests.

Once we know more about the writing in other fields, once we have analyzed psychology and biology and sociology and history writing and found out the ways in which they're alike and the ways in which they're different, then maybe we can teach, not simply a generic course in writing in the sciences or the social sciences, but methods for analyzing the writing in a discipline, for discovering its constraints, and for adapting prose to fit them. That way students can make their own analyses and adjust their writing accordingly. Above all, let's not underestimate the enormity of the task before us and the need to be honest about our own priorities.

It would be very easy, especially in designing or working in

a Writing Across the Curriculum Program, to become a Platonist, describing and prescribing the ideal prose for science classes. After all we know what good writing is, or do we? Stuart Chase once said, "It is much easier to sit at a desk and read plans for a billion gallons of water a day, and look at the maps and photographs: but you will write a better article if you heave yourself out of your comfortable chair and go down in tunnel three and get soaked." Having crossed my own saltmarsh in waders that were miles too big, I agree.

ENDNOTES

1. M. M. Patmat, Heat Production by Sediment: Ecological Significance, Science 215 (January 22, 1982), 395.

2. W. K. W. Li et al, Autotrophic Picoplankton in the Tropical Ocean, Science 219 (January 21, 1983), p.292.

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5. James L. Kinneavy, A Theory of Discourse, Englewood Cliffs, N.J.: Prentice-Hall, 1971, p. .

6. Lester Faigley and Karen Hansen, Learning to Write in the Social Sciences, College Composition and Communication, 36 (1985), 140-149.

7. J. Robert Oppenheimer, cited in Percy Tannenbaum, Communication of Scientific Information, Science, 160 (May 10, 1963), 579-584.

8. B. Michael Kantrowitz, Reaching Diverse Audiences: The Editorial Connection," Paper presented at CCCC, Minneapolis, Minnesota, March, 1985.

9. Stephen Toulmin, Rhetoric and Reasonableness, Paper presented at the Penn State Conference on Rhetoric and Composition, 1985.